

**Before The
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In The Matter Of)

The Development of Operational, Technical)
And Spectrum Requirements for Meeting)
Federal, State and Local Public Safety)
Communications Requirements Through the)
Year 2010)

WT Docket 96-86

COMMENTS OF QUALCOMM INCORPORATED

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SUMMARY

QUALCOMM applauds the FCC for considering re-channelization of the 700 MHz public safety band (764-776/794-806 MHz) to permit public safety agencies to devote up to six 1.25 MHz channels (three for transmit and three for receive) for advanced wireless broadband service, in addition to the total of 12 MHz channelized for narrowband communications.

QUALCOMM agrees with the Commission that “(t)his action is consistent with national priorities focusing on homeland security and broadband and (the FCC’s) commitment to ensure that emergency first responders have access to reliable and interoperable communications” and “(b)roadband technologies, which encompass high-speed digital technologies, hold the potential to provide public safety entities integrated access to voice and high-speed data capabilities.”¹

Our nation’s first responders should have access to an interoperable, high speed, wide area wireless broadband network, the kinds of innovative devices that operate on such a network, and the full panoply of wireless broadband applications, including video surveillance, real-time text messaging and email, and high resolution digital video downloads. These tools are available today in the commercial wireless market, which is driven by constant technological innovation. By leveraging the economies of scale and competitive dynamics in that market, public safety agencies can use these highly beneficial services on a wireless broadband network dedicated to public safety. The Commission should re-channelize the 700 MHz public safety band to enable public safety agencies to take advantage of these important capabilities.

QUALCOMM has developed code division multiple access (CDMA) technology, and, in particular, of the 1xEV-DO air interface, a high speed wide area wireless broadband technology within the CDMA2000 family of technologies and which utilizes 1.25 MHz channels. The

¹ Eighth Notice of Proposed Rule Making, WT Docket 96-86, rel. March 21, 2006 at 1, 3.

original version of 1xEV-DO, Release O, has been deployed by Verizon Wireless, Sprint Nextel, Alaska Communications Services, and twenty six other operators in the US and around the world. It enables peak downloads of 2.4 megabits per second and uploads of 153 kilobits per second.

The latest version of 1xEV-DO, known as Revision A (DOrA) enables peak downloads of 3.1 megabits per second and uploads of up to 1.8 megabits per second. Verizon Wireless and Sprint Nextel are currently deploying DOrA, with commercial service beginning early next year, and other operators around the world are also deploying DOrA, with the first commercial service beginning later this year. If the FCC re-channelizes the 700 MHz public safety band within the next year, DOrA will be the up to date version of EV-DO for public safety to deploy.

QUALCOMM has broadly licensed its intellectual property, to over 130 licensees, ensuring that there is a large, diverse ecosystem of vendors developing 1xEV-DO-based products. To date, 160 different EV-DO devices, including PDAs, smartphones, laptops with 1xEV-DO embedded inside, and mobile phones, have been brought to market by 25 manufacturers. In 2004, there were 11 million EV-DO devices sold; in 2005, the number jumped to 27 million, and in 2006, QUALCOMM estimates that the number will rise to 55 million. The applications offered over 1xEV-DO include video downloads, video and picture messaging, email, web searching, and much more, and EV-DO supports quality of service features, which allow higher priority uses to be guaranteed higher data rates. There are other air interfaces that can use a 1.25 MHz channel, but some are not fully standardized and none has a comparable ecosystem.

Public safety can use these same capabilities over a dedicated network if they are able to devote up to 7.5 MHz (3.75 MHz in forward link and 3.75 MHz in reverse link) in 1.25 MHz

channels to a wireless broadband network, as proposed by NPSTC and Lucent. QUALCOMM believes that, in keeping with the Lucent proposal, a guardband of approximately 1.1 MHz is sufficient to protect narrowband receivers from desensitization from out of band emissions from EV-DO base stations. There is a possibility that any interfering power will be so great that as to create intermodulation products in the narrowband receiver. There is no significant difference in this regard between a SAM interferer or an EV-DO or other broadband interferer which occupies a significant portion of the proposed 3.75 MHz bandwidth. We believe that a guardband of approximately 1.1 MHz is adequate to ensure that there is a low probability of degradation in narrowband receivers due either to interference from out of band emissions or intermodulation degradation from EV-DO base stations.

Moreover, a guardband of 975 kHz between SAM wideband operations and EV-DO, as provided in the NPSTC proposal, will provide protection for SAM wideband receivers from out of band emissions, receiver desensitization, and intermodulation products from EV-DO base stations, that will be very similar to the protection provided to narrowband with a 1.1 MHz guardband between narrowband and EV-DO, as described above. A guardband of just 285 KHz is required to protect EV-DO receivers from out of band emissions from the narrowband base stations.

The NPRM asks for comment on whether the Commission should re-channelize the band to accommodate broadband as opposed to wideband, either by maintaining the current channelization or by allowing public safety agencies to choose between broadband and wideband. QUALCOMM believes that broadband will deliver data much faster with far greater capacity and range than wideband. In particular, EV-DO delivers data faster than SAM by several orders of magnitude. As the NPRM states, “(a) technology that can dramatically reduce

the time it takes to access information in emergencies can mean the difference between life and death.”² EV-DO’s coverage is better than SAM’s, and EV-DO has far more capacity. As a result, EV-DO cell antennas can be located higher than SAM cell antennas, and an EV-DO network can serve the same number of users with larger cells. By locating its antennas higher, EV-DO will create less interference to nearby narrowband receivers. Moreover, SAM has no ecosystem today, nor is one likely to develop. By contrast, EV-DO will give public safety access to a broad array of devices and applications from many vendors.

The NPRM asks whether the FCC should adopt interoperability standards. If public safety entities deploy EV-DO, either via national or regional networks, the EV-DO standard ensures that there will be full interoperability. But, if public safety agencies launch networks based on different air interfaces, then interoperability would be a serious problem. In that event, to achieve interoperability, expensive multi-mode devices would have to be developed, a process that would take a considerable period of time and drive up costs substantially. The FCC should encourage, if not require, public safety to coalesce behind a single air interface that is a public standard, EV-DO.

For all these reasons, QUALCOMM respectfully requests that the 700 MHz public safety band be re-channelized so that public safety agencies can use up to six 1.25 MHz channels, three for transmit and three for receive, for a wireless broadband network based on the EV-DO technology.

² Eighth Notice of Proposed Rule Making at Pg. 3.

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COMMENTS OF QUALCOMM INCORPORATED

QUALCOMM Incorporated (“QUALCOMM”), by its attorneys and pursuant to the Eighth Notice of Proposed Rule Making (the “NPRM”) in this proceeding, FCC 06-34, released March 21, 2006, hereby submits these Comments in response to the questions posed by the Commission concerning whether the 700 MHz public safety band (764-776/794-806 MHz) should be re-channelized to accommodate wireless broadband communications. See NPRM at Pg. 1. QUALCOMM strongly believes that the Commission should re-channelize the band so that public safety agencies can devote up to three 1.25 MHz for transmit and three 1.25 MHz channels for receive in a wireless broadband network based on the 1xEV-DO air interface. First responders deserve to have a state-of-the art, robust wireless broadband system to assist them in protecting lives and property during emergencies, and the Commission should carry out the re-channelization to achieve that important objective.

I. Background

Prior to offering its comments on the specific issues addressed in the NPRM, QUALCOMM believes that it would be beneficial to provide some brief background information

on code division multiple access (“CDMA”) technology, the preeminent wireless broadband technology that could be at the disposal of public safety agencies if the Commission re-channelizes the 700 MHz public safety band, on the proliferation of CDMA technology, and on the ecosystem of infrastructure manufacturers, handset vendors, application developers, and other companies who make products and services to enable CDMA wireless broadband systems to flourish.

A. CDMA Technology

Since its founding in 1985 in San Diego, California, QUALCOMM has developed core digital wireless technology known as code division multiple access (“CDMA”). This technology has been incorporated into standardized technologies deployed by wireless carriers in the United States and around the world. In the second generation of wireless telephony, QUALCOMM developed an air interface known as cdmaOne and standardized in the United States as IS-95. This air interface was deployed in the United States, Korea, Japan, and elsewhere. It used 1.25 MHz channels in a spectrally efficient manner by dramatically increasing the capacity of wireless systems without requiring more spectrum than the existing analog cellular networks used. CDMA technology uses licensed spectrum in the most efficient manner to create as much capacity as possible for voice communications and the greatest speed and throughput for data. The power control inherent in CDMA networks and mobiles ensures that each mobile always transmits exactly enough power to provide satisfactory quality, but never more than is required. A wireless network using IS-95 had over ten times more voice capacity than the first generation analog networks. The IS-95 air interface also enabled wireless networks to deliver data at rates comparable to wireline dial-up technology.

QUALCOMM next proceeded to develop third generation wireless capabilities. In so doing, QUALCOMM was guided by the objectives of achieving even greater spectral efficiency while enabling high speed wireless data transmissions to support the full range of broadband applications and services. As a result, QUALCOMM developed a family of technologies known as CDMA2000, which comprise a third generation (3G) version of CDMA and permitted wireless operators with IS-95-based networks to upgrade to 3G in a backwards compatible manner. Similarly, to enable wireless operators with GSM-based networks to upgrade to 3G-based networks, QUALCOMM (and others) developed technology known as wideband CDMA (also known as WCDMA or UMTS). Both CDMA2000 and WCDMA are extensions of QUALCOMM's core cdmaOne technology. While the CDMA2000 technologies operate in a 1.25 MHz channel compatible with cdmaOne and earlier analog systems, WCDMA requires a 5 MHz channel. A WCDMA carrier is 3.84 MHz wide, so that one WCDMA carrier and the necessary guardband will fit into 5 MHz; but the guardband is somewhat less than provided by three EV-DO carriers. As a result, a CDMA2000 technology, rather than WCDMA, is best suited for the public safety allocation under consideration.

One of the CDMA2000 technologies is known as 1xEV-DO, an air interface that enables wide area wireless broadband communications over a single 1.25 MHz channel. EV-DO optimizes a 1.25 MHz channel for high speed wireless data communication. By dividing an allocation into separate voice and data channels, using EV-DO for data improves overall network efficiency and eliminates the chance that an increase in voice traffic will cause data rates to drop. Release 0 enables peak wireless downloads of 2.4 megabits per second and uploads of up to 153 kilobits per second. It enables average data download rates of 400 to 700 kilobits per second.

The latest version of 1xEV-DO, known as Revision A or “DOrA,” enables peak downloads of 3.1 megabits per second and peak uploads of up to 1.8 megabits per second. DOrA also supports mobile voice over internet protocol. Verizon Wireless and Sprint Nextel are currently in the midst of deploying DOrA this year, with their first commercial services based on DOrA beginning early next year. Other carriers around the world are also deploying DOrA, with the first commercial service beginning later this year. Thus, DOrA is the latest and most advanced version of EV-DO available for public safety deployment upon the end of this proceeding.

B. The Proliferation of CDMA Technology

Since its initial deployments, CDMA has proliferated around the world at a very rapid pace, particularly here in the United States, where it is the fastest growing wireless technology. 3G CDMA networks have been deployed by a total of 196 wireless operators, which are based in the United States and 83 other countries around the world. A total of 143 of these operators have reported that they have over 273 million subscribers for 3G CDMA services. Operators in the United States and elsewhere around the world who have deployed 3G CDMA have experienced dramatic and rapid growth both in terms of numbers of subscribers and average revenue per subscriber.³

Around the world, there are 33 operators who have deployed 1xEV-DO. Here in the United States, Verizon Wireless, Sprint Nextel, ALLTEL, Midwest Wireless, and Alaska Communications Services have all deployed 1xEV-DO. Today, over 24 million subscribers around the world use 1xEV-DO, and this number is accelerating at a very rapid pace. These

³ Additional information about the proliferation of 3G CDMA services is available at www.3gtoday.com.

subscribers enjoy services such as video downloads, video messaging, picture messaging, email, web browsing, and much more.

Further, as already noted, Verizon Wireless and Sprint Nextel are both deploying DOrA this year, and other carriers around the world are doing the same. DOrA-based networks will have the capability to deliver mobile voice over internet protocol, as well as a host of broadband applications and services that require fast uploads as well as fast downloads.

C. The CDMA Ecosystem

As noted supra, QUALCOMM broadly licenses its intellectual property in CDMA. In all, QUALCOMM has licensed 98 manufacturers to sell CDMA-based subscriber products, 40 manufacturers to sell CDMA-based infrastructure equipment, 12 manufacturers to sell CDMA component products, and 19 manufacturers to sell CDMA test equipment.⁴ These licensees include virtually every major manufacturer in the wireless telecommunications market. The result of this licensing program is that the market for CDMA-based equipment is robust and extremely competitive.

With respect to 1xEV-DO-based products, 160 different EV-DO devices, including PDAs, smartphones, laptops with 1xEV-DO embedded inside, and mobile phones, have been brought to market by 25 manufacturers. In particular, five manufacturers of laptop computers now sell laptops with EV-DO embedded inside the laptops, and there twenty five different models of EV-DO embedded laptops on the market.

Moreover, both the number of manufacturers making EV-DO based equipment and the sheer variety of the devices being made continue to increase rapidly. In 2004, there were 11 million EV-DO devices sold; in 2005, the number jumped to 27 million, and in 2006,

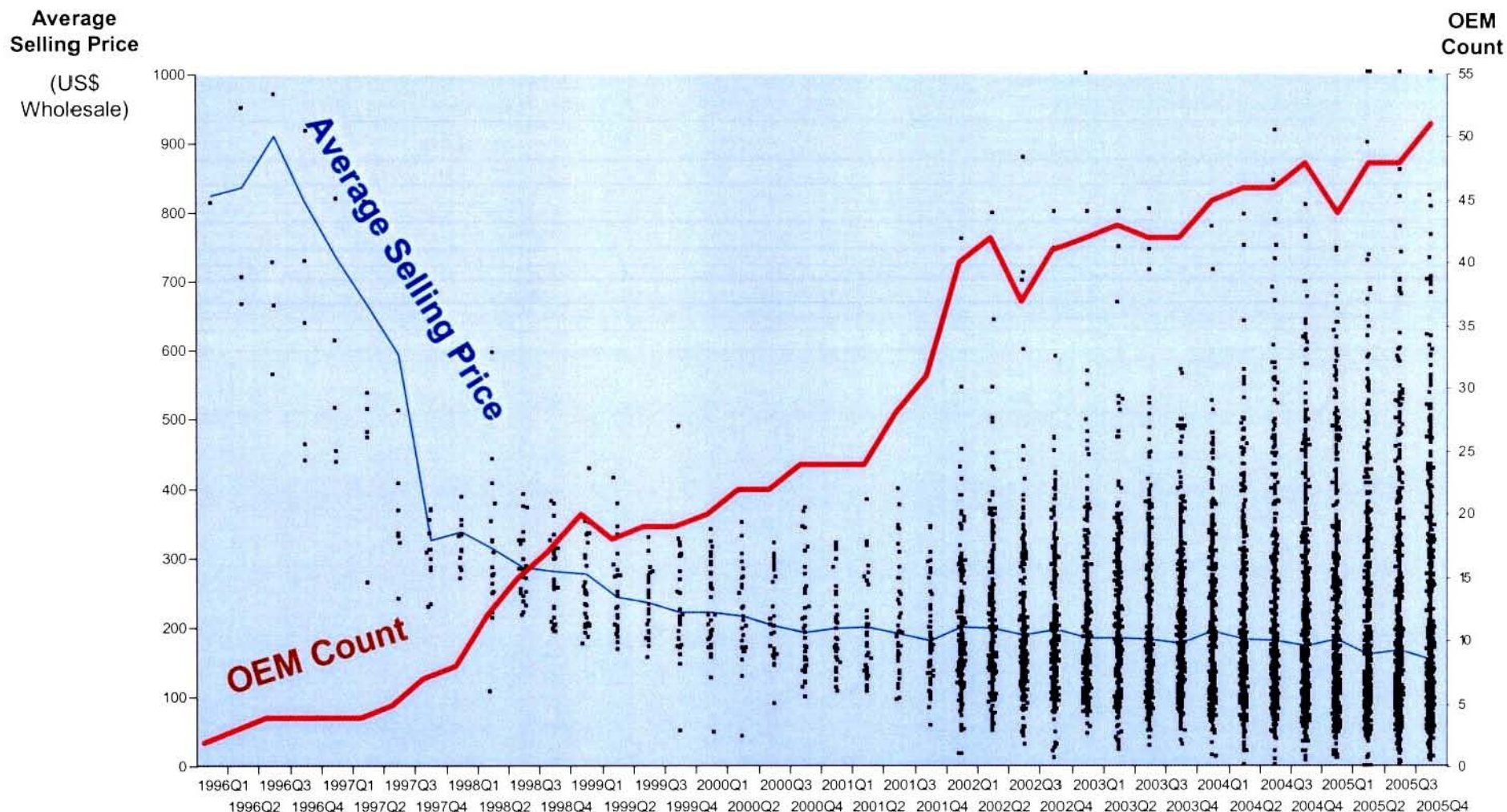
⁴ A complete list of these licensees is available at:
<http://www.qualcomm.com/technology/licensing/index.html>.

QUALCOMM projects the number to rise to 55 million. The charts on the following three pages demonstrate vividly that as the number of manufacturers making CDMA2000 device has increased along with the number of devices, prices have fallen at a rapid rate. The charts show that the CDMA2000 market is characterized by an ever-growing number of manufacturers developing products for an ever-expanding subscriber base, which drives constant economies of scale that bring prices down. The last chart shows that the robust competition among manufacturers of EV-DO data devices (embedded modules, PC modem cards, and other data devices) provides operators of EV-DO networks with a wide choice of such devices at sharply decreasing prices.

The CDMA ecosystem includes not only device and equipment manufacturers, but also a large number of application developers, who have developed a broad array of applications for use on wireless broadband networks. These applications include video download services, email, instant messaging, web searching, position location services, and other information and productivity-enhancing services.

Finally, there is CDMA equipment that has been developed specifically for public safety agencies. Moreover, a number of public safety agencies already use EV-DO services over commercial networks. QUALCOMM itself has been in the forefront of this activity through QUALCOMM Government Technologies (“QGOV”), a division of QUALCOMM that has developed products for use by governmental entities based on CDMA technology since the founding of the company. One such product is the QSEC-2700, a secure CDMA phone that can be used for high assurance, end-to-end encryption voice and data communications. This product allows for information sharing at the Top Secret level over commercial CDMA networks. Another such product is the QUALCOMM Deployable Base Station (QDBS), which is a

CDMA2000 Competition Provides Operators a Wide Choice



Over the past decade, QUALCOMM licensees have commercialized more than 1,000 phone models spanning all price points, providing operators with maximum flexibility to meet customer demands.

Lowering the Cost of CDMA2000 Devices

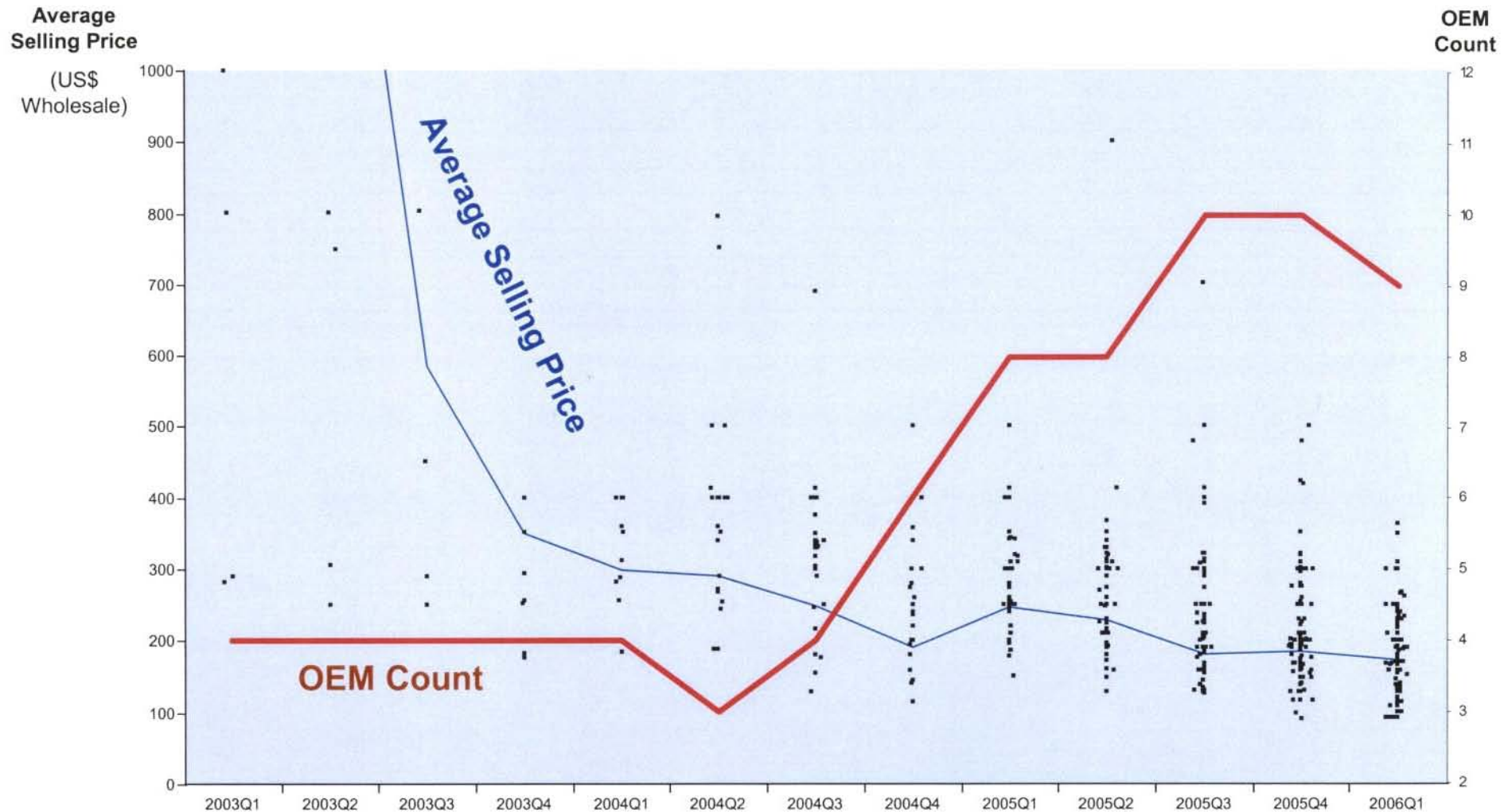
CDMA2000 = Highest Capacity Networks, Less Infrastructure Cost



Note: CDMA Devices Sold per Calendar Year; Lowest end phones sold in quantities over 150,000 units with on-going shipments

Source: QUALCOMM Incorporated

1xEV-DO Competition Provides Operators a Wide Choice of Data Devices



More than 1.7M EV-DO Modules and Data Devices Sold since 2003

compact, easy to deploy and operate portable CDMA base station. The QDBS can provide voice and data communications in emergencies when wireless networks are otherwise not available, such as during natural disasters, and is, therefore, extremely useful for public safety agencies. As proved by Hurricane Katrina, any and all wireless networks can be disabled by natural disasters, and providing public safety agencies with the ability to use off the shelf cellular devices is a cost effective way to enable critical voice and data communications in a disaster.

Consequently, there is a broad and deep CDMA ecosystem. If public safety agencies can use the 700 MHz public safety band to deploy EV-DO, they can leverage the continuous innovations and the rapidly increasing economies of scale to obtain the products and services for highly effective wireless broadband service at affordable prices.

II. An EV-DO Wireless Broadband Network in the 700 MHz Public Safety Band Would Be Highly Beneficial for Public Safety Agencies

QUALCOMM fully agrees with the Commission that public safety agencies, and their first responders in the field, would benefit in countless ways from “development of an integrated, interoperable network capable of delivering broadband services nationwide.”⁵ The original band plan for the 700 MHz band plan was adopted in 1998. At that time, there were no wireless broadband networks in operation in the United States or elsewhere. Even so, the Commission’s goal then, in setting the band plan and other rules for the band, was to “enable public safety organizations to effectively use this new allocation for a variety of operational modes (voice, data, image/high speed data (hsd), and video.”⁶ In 2006, it is wireless broadband systems that are providing voice, data, image/high speed data (hsd) and video on a commercial

⁵ NPRM at Pg. 3.

⁶ First Report and Order, WT Docket No. 96-86, 14 FCC Rcd152, 156 (1998), cited in NPRM at Pg. 2.

basis. For public safety to have access to these same capabilities, they need to be able to deploy wireless broadband, but cannot do so unless the Commission re-channelizes the band and establishes multiple 1.25 MHz channels.

In the NPRM, the Commission asked whether there are applications for which the 700 MHz public safety spectrum is uniquely suitable. NPRM at Pg. 8. The answer is a resounding yes. The 700 MHz public safety spectrum offers far better propagation than the 4.9 GHz band, where spectrum has also been allocated for public safety. This means that the cost of constructing a network capable of delivering advanced, broadband-type applications, such as video downloads, will be much lower if 700 MHz spectrum is used, as opposed to 4.9 GHz or any of the other spectrum above 700 MHz that is allocated or may become available to public safety. A broadband network at 4.9 GHz would need many more cell sites per market to achieve the same coverage as a broadband network at 700 MHz. The costs of building a broadband network at 4.9 GHz would exceedingly high—certainly so high as to make construction and operation of such a network to be infeasible. High resolution video downloads do consume bandwidth. The best solution to provide sufficient capacity for such downloads is to construct an EV-DO network in the 700 MHz public safety band on as many channels as possible, not to relegate this service to the 4.9 GHz band, where it will not be economically feasible to build a wireless broadband network with adequate coverage. The re-channelization of the 700 MHz public safety band is extremely important because of the unique attributes of that band.

The 1xEV-DO technology is very well suited to provide public safety with voice, data, applications that require high speed data (hsd), such as image transfer, video, and database lookup. As has been shown supra, EV-DO is used today to provide those same services today in the United States (and elsewhere) on commercial networks. By contrast, there is no wideband

data network providing these services on a widespread commercial basis. In order to allow public safety to have access to the same technologies that the people they are protecting have, the Commission should re-channelize the 700 MHz public safety band so that public safety agencies can use the EV-DO technology, and the capabilities it will bring, on a dedicated public safety network.

We now turn to various technical questions posed by the Commission in the NPRM.

III. A Guardband of Approximately 1.1 MHz Is Sufficient to Protect Both Narrowband and Broadband Operations from Interfering with One Another

The NPRM asks for comment on the size of the guardband that would be needed to avoid interference between broadband and narrowband operations. NPRM at Pg. 8. QUALCOMM believes that a guardband of approximately 1.1 MHz will be sufficient to protect EV-DO and narrowband operations from interfering with one another. QUALCOMM also believes that a guardband of 975 kHz will be sufficient to protect SAM wideband receivers any interference from EV-DO operations.

A. Protection of EV-DO from Wideband or Narrowband Interference

First, we consider the protection of EV-DO operations from wideband or narrowband interference. With respect to possible desensitization of EV-DO receivers, the 1xEV-DO minimum performance specification requires that no more than 3 dB sensitivity degradation occurs in the presence of a -30 dBm CW signal placed at 900 kHz from the receive frequency.⁷ Since the 900 kHz is measured between center frequencies, the implied guardband is only 900 kHz – 1.25 MHz/2 = 275 kHz. This calculation does not consider the possibility of multiple

⁷ See C.S0033-A v1.0 Recommended Minimum Performance Standards for cdma2000 High Rate Packet Data Access Terminal, December 2005. (“EV-DO Minimum Performance Specification”).

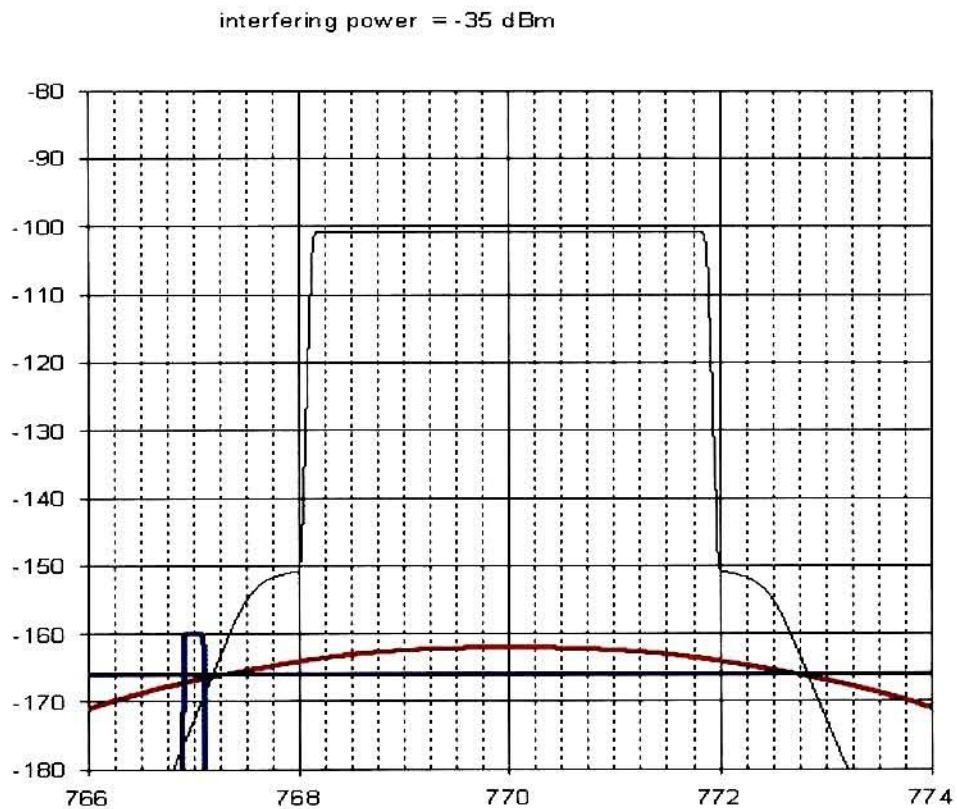
narrowband jammers, but even so, with a guardband of approximately 1 MHz, DO receiver desensitization should not be a limiting factor in the Commission's considerations as to the appropriate size of the guardband required between broadband and wideband or narrowband operations. It is important to note that cellular handsets include low noise amplifier (LNA) gain switching, which adapts to conditions of high level interference when desired signals are not at threshold. This process has proven to reduce greatly the probability of outages due to close-by, high-level narrowband AMPS interference. .

Turning to out of band emissions to EV-DO, according to Slide 22 in Motorola's ex parte filing of October 26, 2005, the guardband required from the edge of a SAM 150 kHz carrier is 275 kHz. This requirement assumed 3 dB EV-DO sensitivity degradation, 8 dB access terminal (AT) receiver noise figure, 75 dB propagation loss, and the spectral mask specified in Motorola's filing. Under these conditions, the total received jammer power is -30 dBm/150 kHz (-82 dBm/Hz). Based on the results shown in Slide 22 in Motorola's ex parte filing, out of band interference from the SAM transmitters to the EV-DO receivers will also not be a limiting factor in determining the size of the guardband required.

B. Protection of Wideband Receivers from Out of Band Emissions and Intermodulation Interference from EV-DO

With respect to the possible desensitization of wideband receivers from EV-DO, the SAM Minimum Performance Specification requires that no more than 3 dB sensitivity degradation occurs in the presence of a -35 dBm interfering signal, where the interfering signal is 600 kHz or more away from the receive frequency. Therefore, we will assume that the interfering EV-DO base station signal is received at -35dBm power. The following figure shows the received power spectral density (in dBm/Hz) as a function of frequency in the presence of three EV-DO carriers received at a total power of -35dBm. (The intermodulation product

generated within a SAM receiver, assuming $IIP3 = -5\text{dBm}$, is also shown in red.) The noise floor shown in the figure assumes an 8dB receiver noise figure. As it can be seen, a guardband of approximately 975kHz is sufficient when the received interference power is limited to the spurious response rejection capability defined in the SAM Minimum Performance Specification.



In summary, to protect SAM receivers from the interference from EV-DO, an approximate guardband of 975 kHz would be sufficient.

C. Protection of Narrowband Receivers from Out of Band Emissions from EV-DO

With respect to the possible desensitization of narrowband receivers from just the out of band emissions from EV-DO, we will assume a more pessimistic interference level of -27dBm. This is approximately the same signal level as was assumed in Slide 28 of Motorola's ex parte filing of October 26, 2005. The chart below shows that for a peak density of -93 dBm/Hz and assuming a jammer of -27 dBm, close to what Motorola assumed, the required guardband is approximately 1.1 MHz. Assuming a jammer of -35 dBm, the required guardband is slightly less than 1 MHz, as it was shown in the earlier figure.



In summary, to protect narrowband receivers from out of band emissions from EV-DO, an approximate guardband of 1.1 MHz would be sufficient.

D. Protection of Narrowband Receivers Against Intermodulation Interference

In Motorola's ex parte filing of October 26, 2005, in Slides 28 and 29, it is claimed that for narrowband receivers, the risk of intermodulation interference caused by EV-DO base stations is much greater than that caused by SAM base stations. The cited scenario is where a narrowband receiver attempts to receive a weak base station signal while in the proximity of both a strong narrowband base station and either a strong wideband base station or a strong EV-DO base station. It should be noted that in making this argument, the parameters of the exact scenario modeled was not provided. That information is necessary in order to assess the probability that such a scenario will occur. With such information, a probability threshold could be set, below which such a scenario would not be included.

We assume that the claim is that, in the SAM interferer case, the dominant intermodulation terms will be generated symmetrically around the strong narrowband base station carrier frequency, at multiples of the SAM frequency reuse raster (e.g., if SAM 150kHz is deployed with a reuse of 1/5 then the intermodulation products would be at multiples of $5 \times 150\text{kHz} = 750\text{kHz}$, situated symmetrically around the strong narrowband base station carrier frequency). As long as the narrowband base stations also use a similar reuse raster, it could be ensured that the intermodulation products will coincide with strong narrowband base station signals, but never with weak narrowband base station signals. These assumptions yield a best case scenario for SAM, which may well not coincide with real-world conditions.

In any event, this argument has the following flaws:

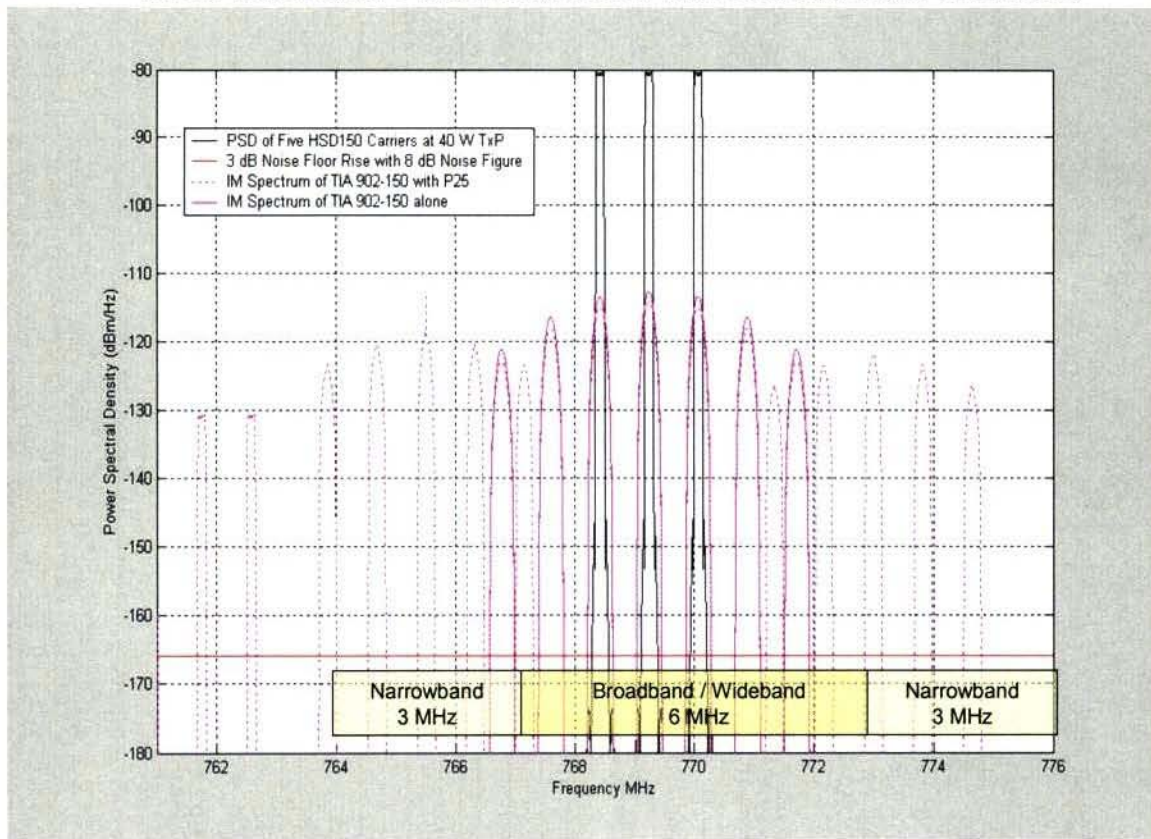
- A given narrowband frequency reuse interlace, e.g., a set of frequencies 750kHz apart according to the example given above, must be used up in a single base station. If some carriers in an interlace are not used by a base station, then they cannot be used by another narrowband base station within a wide area.

- The 5th order intermodulation products were not considered. We estimate that these 5th order products will be no more than 20 dB below the 3rd order products shown in Motorola's Figure 29. This leaves them well above the noise floor of the narrowband receiver. They cannot be ignored.

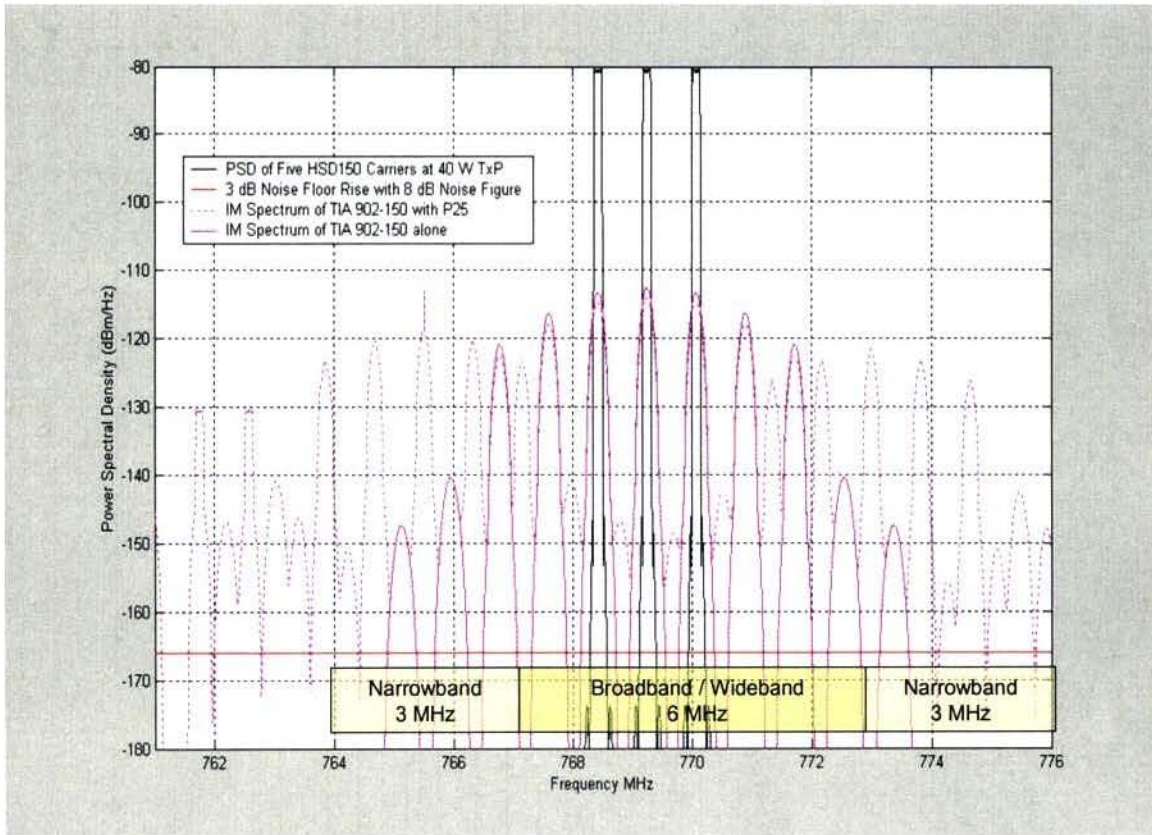
- The cross-terms among the SAM carriers will be more pervasive if we assume five SAM carriers from the interfering base station instead of the three assumed in the Motorola ex parte filing.

The above points are illustrated in the four figures below. The first figure is a repetition of the 3rd order intermodulation results for three SAM carriers as shown in the Motorola ex parte filing. The second figure shows the same scenario but with also considering the 5th order products. The third figure shows 3rd order intermodulation results with five SAM carriers. The fourth figure shows the same scenario but also includes the 5th order products.

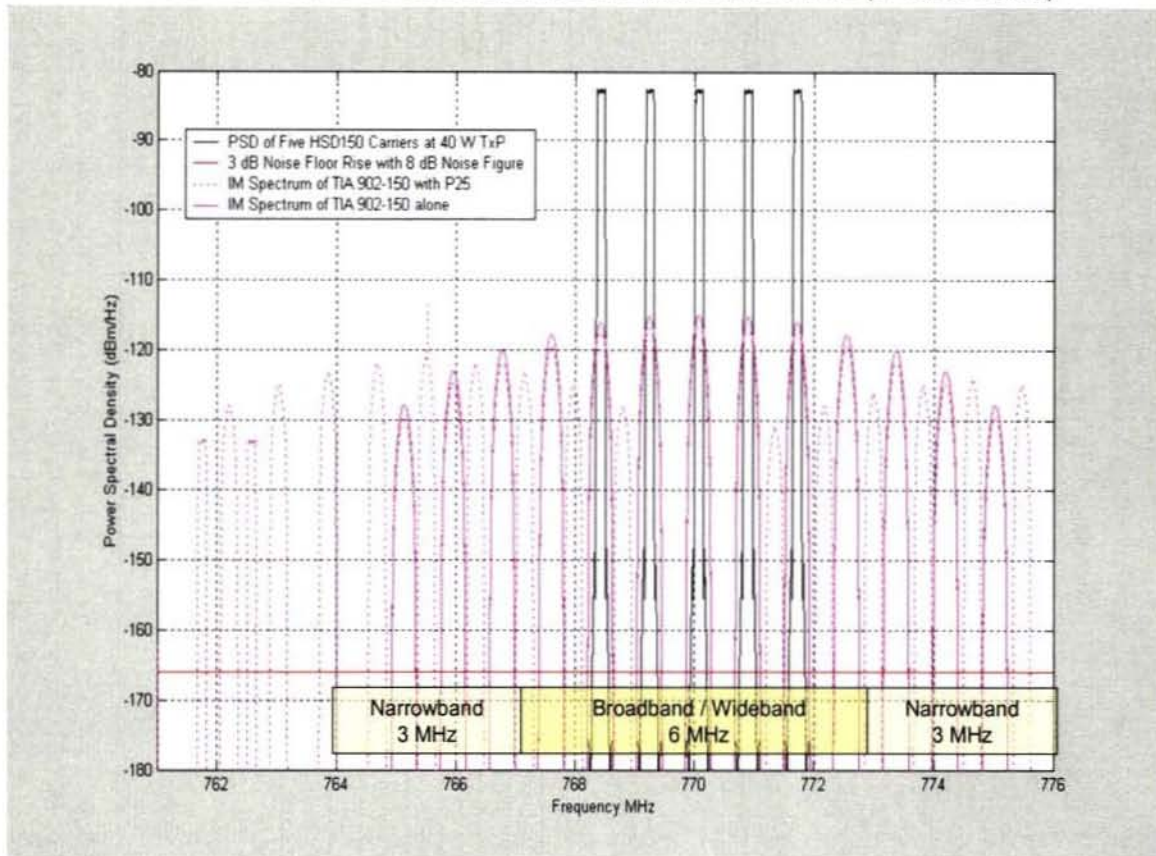
TIA-902 150kHz IM in PS Narrowband Receiver with 3 SAM Carriers (3rd Order Terms)



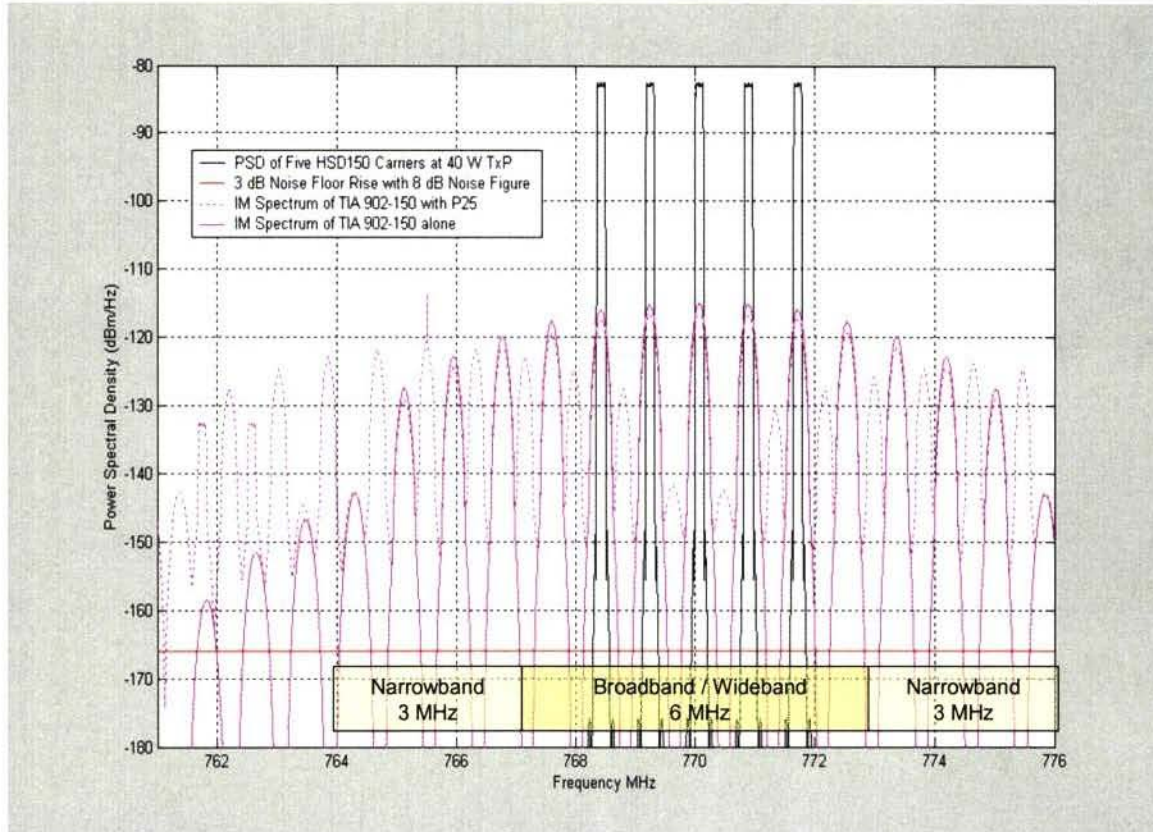
TIA-902 150kHz IM in PS Narrowband Receiver with 3 SAM Carriers (3rd and 5th Order Terms)



TIA-902 150kHz IM in PS Narrowband Receiver with 5 SAM Carriers (3rd Order Terms)



TIA-902 150kHz IM in PS Narrowband Receiver with 5 SAM Carriers (3rd and 5th Order Terms)



It should be noted that the five carrier case shown in the charts above assumes the same total SAM transmit power as the three carrier case. Therefore, the PSD in the five carrier case is about 2 dB lower than the three carrier case. Moreover, appropriate scaling was used so as to make the figures close to what was presented in the Motorola ex parte filing.

These charts show that with five SAM carriers used, most interference gaps are filled. The fifth order products also eliminate all gaps even with only three carriers. There is no significantly greater likelihood of intermodulation interference if public safety agencies deploy EV-DO than if such agencies deploy SAM. To eliminate all chance of intermodulation interference in either scenario, the Commission would have to adopt an intricate set of

deployment restrictions, which would limit the flexibility of public safety agencies, or there would have to be a new generation of narrowband radios developed. In our view, adopting any such restriction would not be dependent on the choice of technology for the 764-776/794-806 MHz public safety band.

Overall, we believe that a guardband of approximately 1.1 MHz is adequate to ensure that there is a low probability of degradation in narrowband receivers due either to interference from out of band emissions or intermodulation degradation from EV-DO base stations. In order to see degradation, the interference must be large (greater than about -35 dBm) and the desired signal small (less than about 20 dB from threshold). This possibility cannot be eliminated altogether, but we believe that the fraction of locations where this joint condition will occur is quite low.

Finally, it should be noted that the band plan proposals before the Commission all divide the two 12 MHz segments of the 700 MHz public safety band into a 3/6/3 arrangement. The two 3 MHz segments are devoted to narrowband, and the 6 MHz segment in the middle is either for broadband and the associated guardband or broadband, wideband, and the associated guardband. Placing the 6 MHz broadband/wideband segment in the middle of the band necessitates two guardbands—one on each side of the broadband/wideband segment. If the Commission arranged the band into a 6/6 arrangement, putting all the narrowband channels into one 6 MHz segment, only one guardband would be required, and a much better use of the overall allocation would be achieved.

IV. EV-DO Delivers Data Much Faster Than SAM and Provides Better Coverage Than SAM

In the NPRM, the Commission states that “(a)s Motorola has observed, wideband provides better coverage while broadband provides higher data rates.”⁸ EV-DO does deliver data faster than SAM by several orders of magnitude. In fact, however, assuming comparable throughput and capacity, the coverage provided by EV-DO is equal to or better than SAM. Our analysis, which is based on assuming the same radio parameters (transmitter power, noise figures, antenna height and type, etc.) for EV-DO and SAM is as follows.

The detailed assumptions for Motorola’s claim that SAM has better coverage than EV-DO are not stated in their October 26, 2005 filing in which they made the claim. We assume that Motorola’s assumptions and resultant argument are along these lines. Since EV-DO uses 1/1 frequency reuse, in order to achieve a certain SNR at the base station, the access terminal (AT) has to transmit at a power that is RoT (dB) higher than what would be needed in an interference free case. RoT is the reverse link (RL) rise-over-thermal. The numbers in Motorola’s filing imply a RoT close to 6dB, which will be used here; we note, however, that the operating RoT, even at full RL capacity, is often lower than 6 dB, and at a capacity equal to SAM, is much less than 6 dB. If the propagation loss can be expressed as $L = B \cdot d^\gamma$, where d is the distance from the AT to the base station, then the maximum coverage distance for an interference free system is $\ln(RoT / \gamma)$ times more than that for EV-DO. With $\gamma = 3.5$,^{9, 10} we have a coverage ratio of 1.48, which would result in a required number of cell site ratio of $1.48^2 = 2.2$.

⁸ NPRM at Pg. 14.

⁹ COST231 Hata Urban Propagation Model, BS antenna height 32m, AT antenna height 1.5m

¹⁰ The data in Motorola’s October 26, 2005 ex parte filing appears to assume $\gamma = 3.32$ instead of $\gamma = 3.5$

This result approximately matches certain data points found in Motorola's filing.

Specifically, the numbers highlighted in yellow in the table below reflect a factor of 2.3 between the required number of cell sites for EV-DO and SAM 150kHz.

“Near-Far” OOBE Interference Conflicts Increase as Opportunities to Co-locate Data & Voice Stations Decrease

	No of sites for equivalent coverage (designed for <u>portable</u> coverage)	Max % of data & voice co-location (designed for <u>portable</u> coverage)	No of sites for equivalent coverage (designed for <u>mobile</u> coverage)	Max % of data & voice co-location (designed for <u>mobile</u> coverage)
P25 Voice	40 ⁰	Reference	10 ⁰	Reference
50 kHz TIA 902(SAM)	82 ¹	49%	5 ²	100 %
150 kHz TIA 902(SAM)	158 ¹	25%	10 ²	100 %
1.25 MHz OFDM	240 ¹	17%	15 ²	67%
5 MHz 802.16e			39 ⁴ 158 ³	25% 6%
1.25 MHz EVDO	362 ¹	11%	23 ²	43%
1.25 MHz EVDO-A			60 ⁴ 240 ³	17% 4%

More Near-Far Conflicts

⁰ 3 W Portable/30W mobile
¹ 200 mW PCMCIA Card & 3 dB antenna loss w/r portable
² 10 W Mobile
³ 200 mW PCMCIA Card with external antenna (i.e., available technology)
⁴ 1 W Mobile (higher availability than a 10 Watt mobile)

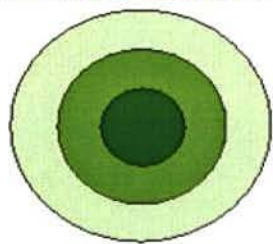
QUALCOMM submits that in considering the figures in the preceding table, which appears in Motorola's ex parte filing, only values corresponding to the same AT power should be considered. For example, it makes little sense to compare a mobile with 5 W transmission power with those with 10 W transmission power. Moreover, the table ignores the capacity of the various systems. To achieve equal capacity in a SAM 150 KHz system as an EV-DO system, the SAM system would need many more cell sites than the EV-DO system, which drives up the cost of the SAM system and increases the interference, as already shown herein. An appropriately

configured EV-DO network can achieve the same coverage as SAM 150 KHz, and the EV-DO network will still have better throughput.

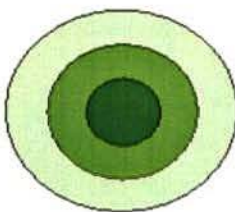
Motorola's data in the above chart and elsewhere in their October 26, 2005 ex parte purporting to compare 1.25 MHz EV-Do and 5 MHz 802.16e cannot be validated. In slide 33 of that filing, they compare peak user speed and data throughput of 1.25 MHz EV-DO and 5 MHz 802.16e, as they did in the above chart. It appears that neither chart normalizes the two air interfaces to the same bandwidth. In any event, Motorola concedes in slide 25 of their filing that a 5 MHz channel is not a viable option.

With respect to their comparison of SAM and EV-DO, any such comparison should be based on assuming equal AT power capabilities. We then begin by selecting an appropriate rate that is to be supported by a user at the edge of coverage. Based on the data in the Table below from Motorola's filing, we use 76.8kbps (highlighted in red). Often smaller data rates are assumed for edge of coverage users; but if we used less than 76.8 kbps in this analysis, than the results would turn even more favorable to EV-DO.

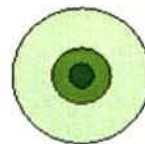
Outbound Data Rate Performance



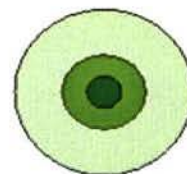
TIA 902 (SAM)
50 kHz



TIA 902 (SAM)
150 kHz



EVDO-A
1.25 MHz



802.16/WiMax
5 MHz

Peak User Speed ¹	70K	290K	2,000K	2,000K+
Ave. Channel Throughput ²	36K	145K	300K	600K
Edge Speed ³	18K	76.8K	76.8K	76.8K

¹ One user on channel standing under antenna. ² Based on 50% inbound. Met for EVDO or 802.16. ³ 9.5% Reliability

We then make the following assumptions:

1. Only the RL is considered, because coverage is typically RL limited due to the smaller AT Tx power relative to the base station.
2. RL data rate of 76.8kbps is assumed
3. It is assumed that the EV-DO and SAM ATs have the same power limit
4. It is assumed that the path loss to the base station is the same for EV-DO and SAM
5. For SAM, a frequency reuse of 1/5 is assumed, because this was implied in slide 29 in the Motorola ex parte filing. The range is reduced due to increased interference, which is

inevitable as the reuse factor is reduced. It is possible to use higher reuse, such as 1/3 but that would further reduce coverage for SAM.

6. It is assumed that SAM is completely interference free (which is quite optimistic).
7. A noise figure of 5dB is assumed for both the EV-DO and SAM base station receivers.

With the above assumptions, we derive the following. With a frequency reuse of 5, there are approximately $1.25\text{MHz} / (5 * 150\text{kHz}) = 1.67$ SAM 150kHz carriers per a EV-DO carrier. Therefore, if the edge of coverage rate is 76.8kbps, then the SAM throughput is $1.67 * 76.8\text{kbps} = 128.3$ kbps served by a given sector in a unit of 1.25MHz bandwidth. To make a reasonably equivalent EV-DO comparison, we assume that a EV-DO sector with frequency reuse 1/1 receives data from two edge-of-coverage users, one with data rate 76.8kbps (call it AT_a), and another one (call it AT_b) with $128.3\text{kbps} - 76.8\text{kbps} = 51.5\text{kbps}$. This way, the total throughput and the number of users served are comparable between the EV-DO and SAM cases under consideration.

Using information from the EV-DO AN Minimum Performance Specification¹¹, in order to receive 76.8kbps data rate from an AT in various fading environments, the received \hat{I}_{or}/I_o must be about -7dB. This means that the received power from AT_a must be about $1/5^{\text{th}}$ of the total received power by the base station. In a power limited scenario, such as the one considered here, we can assume linear scaling, therefore for AT_b the required \hat{I}_{or}/I_{oc} would be -8.7dB.

By using the basic CDMA equations for the SNR, we can make the following approximations:

¹¹ C.S0032-A v1.0 Recommended Minimum Performance Standards for cdma2000 High Rate Packet Data Access Network, December 2005.

$$\hat{I}_{\text{or}}/I_o \Big|_{AT_a} = \frac{\hat{I}_{\text{or}} \Big|_{AT_a}}{(\alpha - 1) \cdot \left(\hat{I}_{\text{or}} \Big|_{AT_a} + \hat{I}_{\text{or}} \Big|_{AT_b} \right) + \hat{I}_{\text{or}} \Big|_{AT_b} + N_o} \quad (1)$$

$$\hat{I}_{\text{or}}/I_o \Big|_{AT_b} = \frac{\hat{I}_{\text{or}} \Big|_{AT_b}}{(\alpha - 1) \cdot \left(\hat{I}_{\text{or}} \Big|_{AT_a} + \hat{I}_{\text{or}} \Big|_{AT_b} \right) + \hat{I}_{\text{or}} \Big|_{AT_a} + N_o} \quad (2)$$

Where α is the increase in interference due to other cells relative to same cell interference. We will assume $\alpha = 1.6$ based on Viterbi's treatise on spread spectrum.¹² Implicitly, we also assume similar loading in all neighboring cells.

By simultaneously solving Eq (1, 2), we get:

$$\begin{aligned} \hat{I}_{\text{or}} \Big|_{AT_a} &= 0.306 \cdot N_o \\ \hat{I}_{\text{or}} \Big|_{AT_b} &= 0.216 \cdot N_o \end{aligned}$$

The point we are making here is that EV-DO can achieve a throughput equivalent to the throughput achievable with SAM for edge of coverage users, with a RoT of only

$\alpha \cdot \left(\hat{I}_{\text{or}} \Big|_{AT_a} + \hat{I}_{\text{or}} \Big|_{AT_b} \right) + N_o = 2.6\text{dB}$. Therefore, a RoT = 6dB figure, which appears to have been used in Motorola's filing, and which corresponds to an EV-DO network configuration of much higher capacity than SAM, was not a reasonable basis for comparison. Recall that we assumed 0 dB interference margin for SAM, which, as noted, is optimistic and which makes it even less reasonable.

At this point, we can calculate the minimum received power at the EV-DO base station required for a 76.8kbps RL data rate. For this, we use a thermal noise floor of -174dBm/Hz and a receiver noise figure of 5dB. With these, we have

¹² Principles of Spread Spectrum Communication, Andrew J. Viterbi, Addison-Wesley, 1995.

$$\hat{I}_{or} \Big|_{AT_a} = 10 \log_{10} 0.306 - 174 + 10 \log_{10} (1.25 \cdot 10^6) + 5 = -113.2 \text{dBm}$$

Since the EV-DO reverse link is power controlled, we need to add headroom to the above figure in order to account for power control variations. Since every EV-DO base station employs receive diversity, a 4dB headroom is sufficient, therefore we have

$$\hat{I}_{or_min} = \hat{I}_{or} \Big|_{AT_a} + 4 \text{dB} = -109.2 \text{dBm}$$

Now we have to derive what the SAM 150kHz throughput would be at $\hat{I}_{or} = -109.2 \text{dBm}$.

The SAM minimum performance specification¹³ has fading channel demodulation requirements copied in the table below, but unfortunately, the lowest \hat{I}_{or} level used for SAM 150kHz is -94dBm (highlighted in red), at which the tested data rate is 211kbps. Furthermore, the test is evaluated based on uncoded BER, so the comparison would not be meaningful.

Table 5 TU50 Fading Profile

Assigned Bandwidth	Modulation Type	Faded BER	Time Interval (ms)	Receiver Input Level		
				Mobile (dBm)	Portable (dBm)	Base Station (dBm)
50 kHz	64-QAM	1%	320	-86	-86	-87
	16-QAM	1%	320	-92	-92	-93
	QPSK	1%	320	-97	-97	-98
100 kHz	64-QAM	1%	320	-83	-83	-84
	16-QAM	1%	320	-89	-89	-90
	QPSK	1%	320	-94	-94	-95
150 kHz	64-QAM	1%	320	-83	-83	-83
	16-QAM	1%	320	-89	-89	-89
	QPSK	1%	320	-94	-94	-94

¹³ See n.8, *supra*.

We made a comparison based on the data in O'Hara's publication on 700 MHz wideband data.¹⁴ The relevant table from that publication is copied below. The data in this table is for SAM 50kHz, so first we have to convert to SAM 150kHz. Since the studied case corresponds to a power limited scenario, it is reasonable to increase the data rates in the table below by a factor of 3, and also to increase the required power by 5dB in order to model SAM 150kHz. Because the table is for the SAM FL, the data is somewhat optimistic for SAM given that it ignores some of the overhead associated with the SAM RL.

It appears that the table assumes a 9dB receiver noise figure. In order to keep a level comparison with EV-DO, where we assumed a noise figure of 5dB, we will compensate by adding 4dB to the calculated received power for SAM.

Symbol Es/No	Power dBm	SAM Throughput (kbps), 50 kHz Channel Width				
		QPSK 1/2	16QAM 1/2	64QAM 2/3	64QAM	MAX
0	-116.01	4.14	0.00	0.00	0.00	4.14
4	-112.01	13.80	0.00	0.00	0.00	13.80
8	-108.01	20.70	19.32	0.00	0.00	20.70
12	-104.01	25.12	35.88	0.00	0.00	35.88
16	-100.01	27.05	48.02	33.12	0.00	48.02
20	-96.01	27.49	53.88	66.24	0.00	66.24
24	-92.01	27.59	54.87	93.84	0.00	93.84
28	-88.01	27.60	55.17	103.78	0.48	103.78
32	-84.01	27.60	55.20	107.97	12.58	107.97
36	-80.01	27.60	55.20	109.74	49.17	109.74
40	-76.01	27.60	55.20	110.21	84.83	110.21
44	-72.01	27.60	55.20	110.37	105.73	110.37
GROSS		76.80	153.60	230.40	230.40	230.40
NET		67.20	134.40	201.60	201.60	201.60
N/G		87.50%	87.50%	87.50%	87.50%	87.50%
MaxT/G		35.94%	35.94%	47.90%	45.89%	47.90%
AVET		23.66	40.66	61.27	21.07	68.72

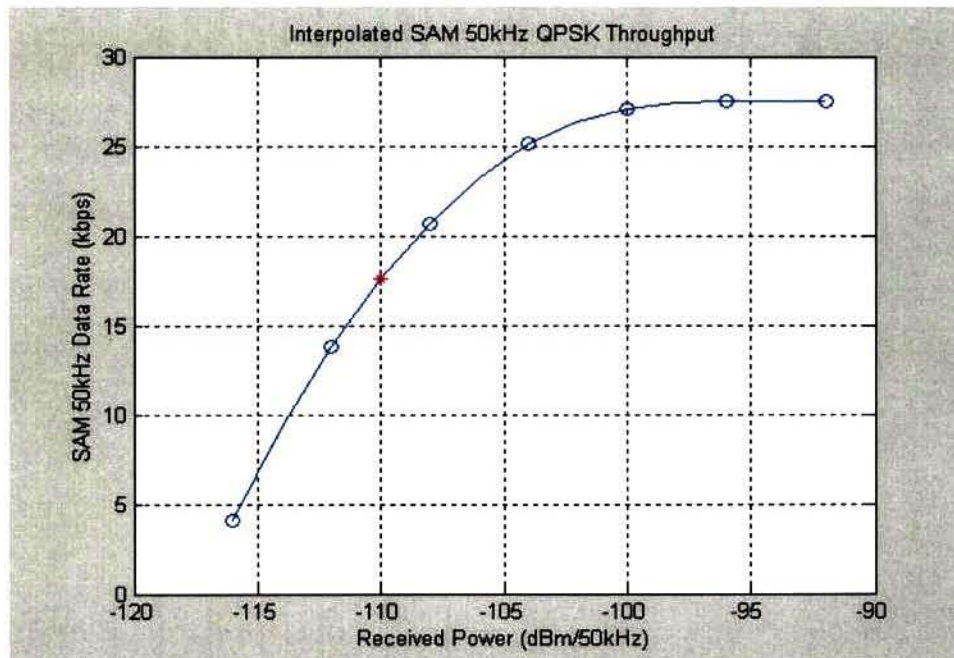
Based on the arguments above, the SAM receiver would see

$$\hat{I}_{or} = -109.2\text{dBm} + 4\text{dB} - 5\text{dB} = -110\text{dBm} / 50\text{kHz}$$

¹⁴ 700 MHz Wideband Data Loading Factors, Sean O'Hara, Syracuse Research Corporation.

where the 4dB term accounts for the different noise figure assumptions and the 5dB term accounts for the 150kHz to 50kHz conversion.

Since there is no entry in the table above for -110dBm power, we need to interpolate between the $(-108\text{dBm}, 20.7\text{kbps})$ and $(-112\text{dBm}, 13.8\text{kbps})$ data points for QPSK. The interpolation is based on the figure below, which was derived from the 3rd column of the SAM throughput table above.



With interpolation to -110dBm , we get $(-110\text{dBm}, 17.6\text{kbps})$ per 50kHz, so in SAM 150kHz, we could expect to have $3 \times 17.6\text{kbps} = 53\text{kbps}$.

This compares with 76.8kbps data rate in the same edge of coverage situation for EV-DO.

Therefore the cell edge data rate in DO is about 45% higher.

Often, the edge of coverage throughput is determined while assuming an unloaded system. In this case, the only source of interference to the received signal is thermal noise. This is the same assumption as was used so far for SAM.

In the unloaded system case, we can calculate the EV-DO required received power for 76.8kbps as

$$\hat{I}_{or} \Big|_{AT} = \frac{\hat{I}_{or}}{I_o} - 174 + 10 \log_{10}(1.25 \cdot 10^6) + k$$

where $\frac{\hat{I}_{or}}{I_o} = -7\text{dB}$ is the EV-DO minimum performance requirement for the 76.8kbps

data rate and $k = 5\text{dB}$ is the base station receiver noise figure. With these, we get

$$\hat{I}_{or} \Big|_{AT} = -115\text{dBm}.$$

Again, with adding a 4dB power control headroom, we get

$$\hat{I}_{or_min} \Big|_{unloaded} = \hat{I}_{or} \Big|_{AT} + 4\text{dB} = -111\text{dBm}.$$

The equivalent SAM power would be

$$\hat{I}_{or} = -111\text{dBm} + 4\text{dB} - 5\text{dB} = -112\text{dBm} / 50\text{kHz}$$

where the 4dB term accounts for the different noise figure assumptions, as before, and the 5dB term accounts for the 150kHz to 50kHz conversion. From the table above, we can see that the corresponding data point is $(-112\text{dBm}, 13.8\text{kbps})$ per 50kHz, so in SAM 150kHz, we could expect to have $3 \cdot 13.8\text{kbps} = 41.4\text{kbps}$. In this case, the EV-DO cell edge data rate of 76.8kbps is about 86% higher.

This analysis shows that EV-DO not only delivers data at faster rates than SAM, but EV-DO's coverage is better than SAM's.

V. EV-DO Has Superior Capacity Than SAM

In addition to having superior data rates and coverage over SAM, EV-DO also has vastly superior capacity assuming that they supporting equal data rates—this is an advantage of many orders of magnitude. There are no publicly available figures on the capacity of a SAM network.

However, we can compare the capacity of a EV-DO network to a network that uses the EDGE air interface. SAM uses 150 KHz carriers, while EDGE uses 200 KHz carriers, and therefore, the capacity of an EDGE network should be roughly comparable to a SAM network.

We begin with the capacity of an EV-DO-based network. In DO Release 0 (DOr0) and DOrA, the throughput is directly proportional with the number of carriers (assuming that the number of users per sector is also scaled accordingly).

Forward link capacity

Receiver Type	Throughput (kbps / sector / 1.25MHz)	Spectral Efficiency (bits/Hz)
DOr0 with no Receive Diversity	870	0.7
DOr0 with Receive Diversity	1,242	0.99
DOrA with Receive Diversity and Equalizer	1,500	1.2

Forward link simulation assumptions:

- Full buffer
- 10 users per sector
- Site-to-site distance 2km
- ITU Channel Model Probabilities:
 - pedA 3km/h 30%,
 - pedB 10km/h 30%,
 - vehA 30km/h 20%,
 - pedA 120km/h 10%,
 - Rician 10%

Reverse link capacity

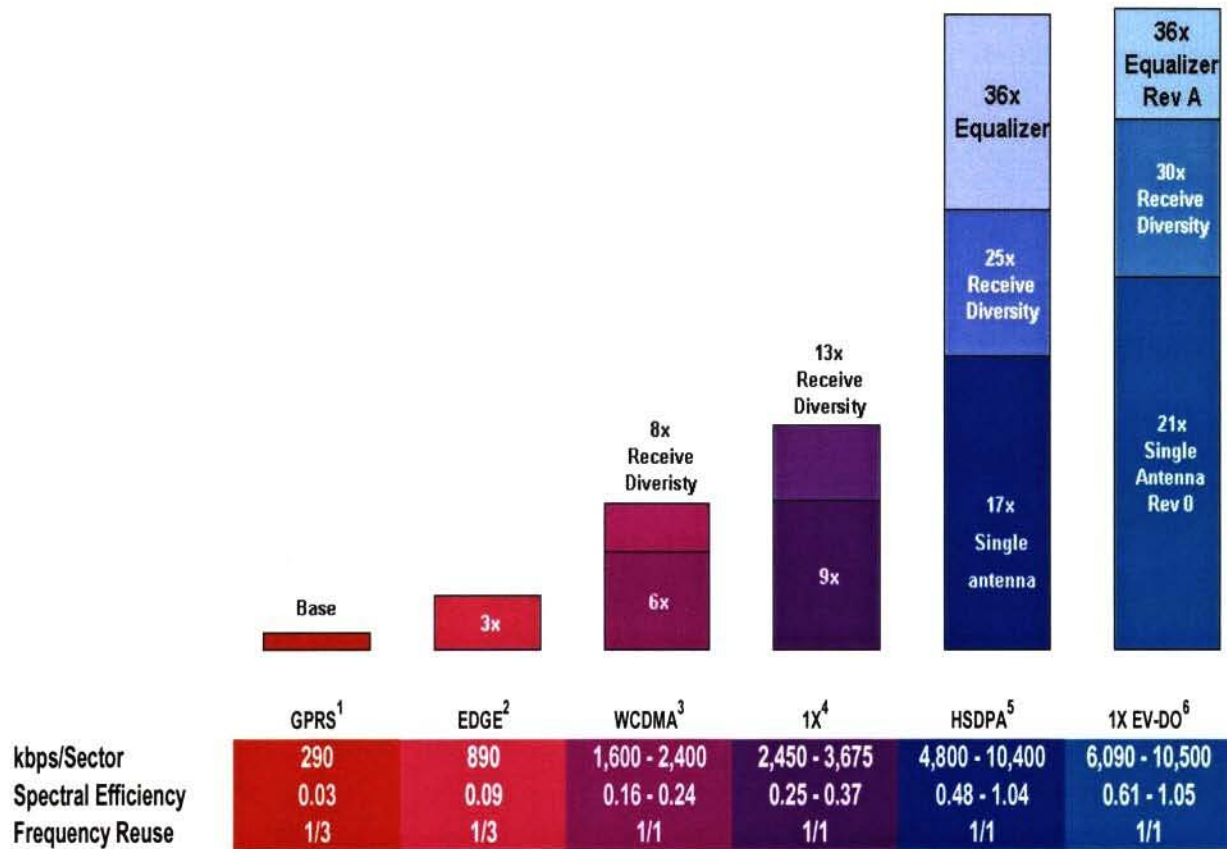
Receiver Type	Throughput (kbps / sector / 1.25MHz)	Spectral Efficiency (bits/Hz)
DOr0 with 2-way Receive Diversity	317	0.25
DOrA with 2-way Receive Diversity	541	0.43
DOrA with 2-way Receive Diversity and SIC	894	0.72
DOrA with 4-way Receive Diversity	1,304	1.04
DOrA with 4-way Receive Diversity and SIC	2,030	1.62

Reverse Link Simulation Assumptions:

- Full buffer
- 10 users per sector
- Site-to-site distance 2km
- Average RoT with non-SIC: 5.5dB
- SIC, Successive Interference Cancellation, includes Pilot and Traffic Interference Cancellation
- ITU Channel Model Probabilities:
 - pedA 3km/h 30%,
 - pedB 10km/h 30%,
 - vehA 30km/h 20%,
 - pedA 120km/h 10%,
 - Rician 10%

Now, turning to EDGE, which can be used as a proxy for SAM given their similar bandwidths, the capacity is much more limited. The following shows that DOrA has twelve times the capacity of EDGE on the forward link and an even greater advantage on the reverse link.

Forward link capacity



The table above uses 10 + 10 MHz. However, using a smaller amount of spectrum will not change the relative performance of the air interfaces shown above to any significant degree.

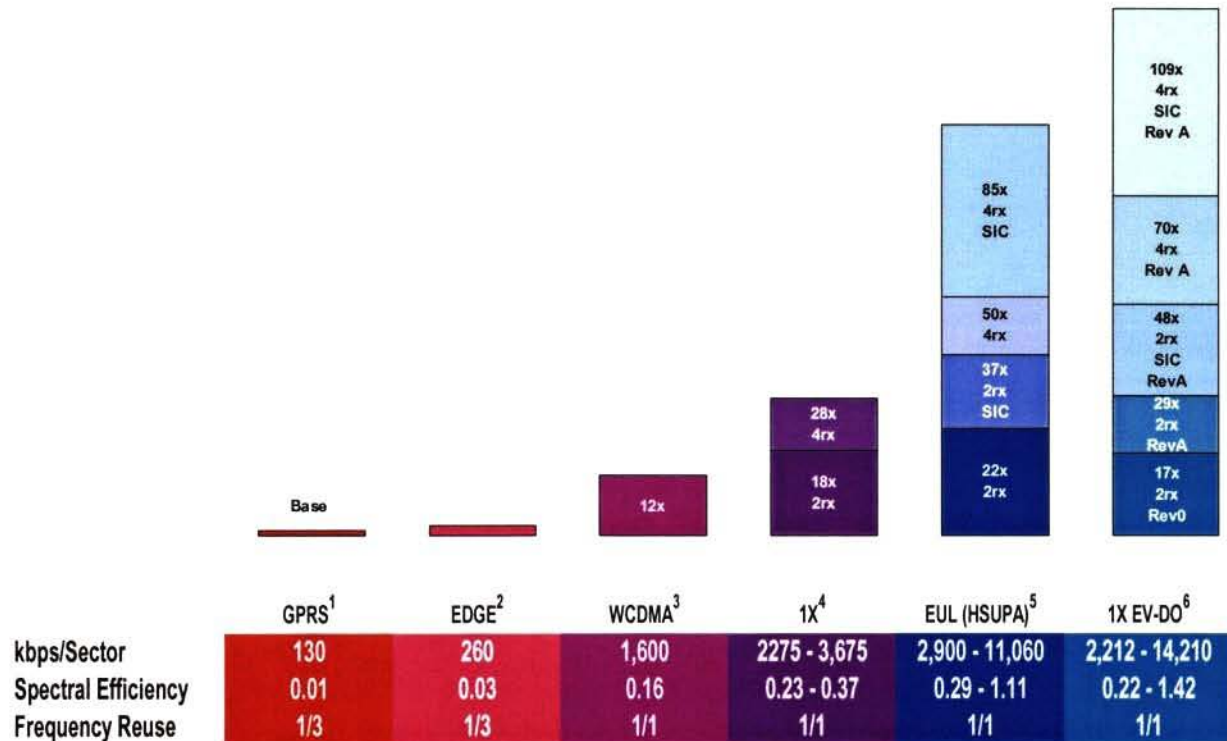
Forward link simulation assumptions:

- EDGE
 - Full buffer
 - Site-to-site distance 2.6km
 - BTS Antenna Gain 17dBi
 - 1 Rx Antenna in mobile
- EV-DO
 - Full buffer

- 10 users per sector
- Site-to-site distance 2km
- ITU Channel Model Probabilities:
 - pedA 3km/h 30%,
 - pedB 10km/h 30%,
 - vehA 30km/h 20%,
 - pedA 120km/h 10%,
 - Rician 10%

It should be noted that while the comparison above used EDGE rather than SAM, the performance of those two air interfaces is similar. In our analysis, EDGE can deliver 890 Kbps in 10 MHz. We showed previously herein that SAM 150 KHz can deliver approximately 128 Kbps in 1.25 MHz or about 384 Kbps in 3.75 MHz. Finally, our analysis shows that when EV-DO supports equal capacity to EDGE or SAM, the loss in link budget due to reverse link ROT of DO will be much smaller than the 5.5 dB assumed for maximum capacity comparison.

Reverse link capacity



The figure above uses 10 + 10 MHz. However, using a smaller amount of spectrum will not change the relative performance of the air interfaces shown above to any significant degree.

Reverse Link Simulation Assumptions

- EDGE
 - Full buffer
 - Site-to-site distance 2.6km
 - BTS Antenna Gain 17dBi
 - 2 Rx antennas in base station
- EV-DO
 - Full buffer
 - 10 users per sector
 - Site-to-site distance 2km

- Average RoT with non-SIC: 5.5dB
- SIC, Successive Interference Cancellation, includes Pilot and Traffic Interference Cancellation
- ITU Channel Model Probabilities:
 - pedA 3km/h 30%,
 - pedB 10km/h 30%,
 - vehA 30km/h 20%,
 - pedA 120km/h 10%,
 - Rician 10%

Motorola has argued that wideband does not require guardband, and that the fact that broadband requires guardband results in a 33% loss of spectrum. In fact, however, because of the 1/5 reuse factor used by SAM as shown by Motorola, there is an 80% loss in spectrum utilization for any given SAM sector. There is SNR gain due to reuse, compensating for some of this loss, but overall, the spectral efficiency of EV-DO is still far more than 33% better than SAM, as the foregoing capacity figures show.

VI. Deployment of EV-DO Will Provide Public Safety with a Network of Sufficient Range

As it was discussed supra, an EV-DO network has equivalent or better range than SAM when equal mobile transmission powers are assumed. The rated maximum transmission power for EV-DO is dependent on the applicable minimum performance specifications and on technical feasibility. As far as technical feasibility is concerned, there is no reason to assume that the maximum transmission power for SAM would be higher than for EV-DO. As a matter of fact, the peak-to-average ratio reduction techniques employed in the EV-DO RL make a higher maximum transmission power for EV-DO the more likely.

With respect to the applicable minimum performance specifications, the limits on maximum transmission power will be determined based on the requirements for public safety applications. The current highest power limit for EV-DO mobiles is 6.3W ERP in the 800MHz cellular band. Since the 764-776/794-806 MHz public safety band will constitute a new Band Class in the EV-DO standard, a higher maximum power requirement can be established by the standards setting organizations if so required to meet a desire by public safety for even higher power EV-DO mobiles.

VII. The FCC Does Not Need to Adopt Interoperability Rules for the Broadband Channels if Public Safety Agencies Coalesce Around Deploying EV-DO

At page 15 of the NPRM, the Commission asked for comment on what measures should be taken to promote interoperability in the broadband environment and whether to adopt interoperability standards for wideband and broadband channels. If public safety agencies coalesce around the deployment of an EV-DO-based networks, the EV-DO standard will ensure that the networks are fully interoperable and compatible with one another. In this event, the Commission would not need to adopt any interoperability standards or rules—there are no non-standardized EV-DO equipment or networks.

In the event that public safety agencies do not coalesce around EV-DO, or any single air interface, and there are public safety networks on the 700 MHz public safety band with multiple air interfaces, then in order to achieve interoperability between the networks, multi-mode terminals will have to be developed. It is likely to take a considerable amount of time and cost significant sums for such development, given the limited size of the public safety market. These problems would be exacerbated if the result of this proceeding is deployment of a hodgepodge of air interfaces, including both wideband and broadband. QUALCOMM respectfully submits that this is not the way to achieve interoperability. Costs will be much lower, and deployment will

occur much faster if public safety can leverage the devices being made for the commercial market, which would not necessarily need to support the multiple air interfaces. Public safety should not have to wait so long and pay so much to achieve interoperability. Interoperability would be attained out of the box if public safety agencies deploy a single broadband air interface, EV-DO.

In the NPRM, the Commission also asked whether it should require that all wideband and broadband radios support SAM; if so, whether such a requirement is easily achievable and could be implemented at little additional expense to public safety; and, the related question of whether SAM is adequate to support high resolution video over large areas. NPRM at Pg. 16. SAM is certainly not adequate to support high resolution video over large areas; it does not support data rates that are nearly fast enough for high resolution video. The Commission should not mandate that all broadband radios support SAM. Such a requirement will significantly delay the initiation of broadband service in the public safety band and will force public safety to incur large costs. There will be far greater benefits to public safety agencies if they can leverage the economies of scale for devices being brought to market for commercial customers. Those economies of scale will be lost for public safety if their radios, but only their radios, have to support broadband and SAM. The Commission should facilitate the rapid and cost effective deployment of broadband by public safety and, therefore, the Commission should not require that public safety radios support SAM and broadband.

VIII. Conclusion

Wherefore, for the foregoing reasons, QUALCOMM respectfully requests that the Commission re-channelize the 700 MHz public safety band so that public safety agencies can deploy a wireless broadband network or networks on 7.5 MHz of the spectrum based on the EV-DO air interface.

Respectfully submitted,

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